(12) UK Patent Application (19) GB (11) 2 272 183 (13) A

(43) Date of A Publication 11.05.1994

(21) Application No 9222350.2

(22) Date of Filing 23.10.1992

(71) Applicant(s)
**Esselte Letraset Limited**

**(Incorporated in the United Kingdom)**

**Kingsnorth Industrial Estate, Wotton Road, ASHFORD, Kent, TN23 2FL, United Kingdom**

(72) Inventor(s)
**Peter McKie**

(74) Agent and/or Address for Service
**Gallafent & Co**
**8 Staple Inn, LONDON, WC1V 7QH, United Kingdom**

(51) INT CL$^5$
**G03G 13/16**

(52) UK CL (Edition M )
**B6C** CGD CSSM C305 C308 C310 C315 C321 C686

(56) Documents Cited
**GB 2077187 A** **GB 1602937 A** **US 4006267 A**

(58) Field of Search
UK CL (Edition K ) **B6C CGD CSAD CSSM**
INT CL$^5$ **G03G 13/16**

# (54) Transferring xerographic images to artwork.

(57) Toner images formed on sheets (which may be of transparent or translucent material) may be transferred to artwork by covering the images with adhesive in order to stick the toner image to the artwork more strongly than it adheres to the backing sheet, and then peeling the backing sheet away. The toner image has adhesive applied to it by selective transfer of a low-tack pressure-sensitive adhesive from a layer of such adhesive on an adhesive substrate. Transfer is effected by bringing the toner image into intimate contact with the layer of adhesive under the action of heat and pressure and then lifting away the substrate. This leaves the backing sheet with the adhesive toner image which sheet can thereafter be used in the manner of a dry transfer sheet to transfer the toner image to artwork. The toner image may be covered, prior to the application of adhesive by the selective application of a further layer of coloured material, such as from a blocking foil.

Transfers (or decalomania) made by such a method are described.

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# TRANSFERRING IMAGES ON TO ARTWORK

This invention relates to adding preformed images to existing artwork.

GB 1 602 937 discloses methods of forming a xerographic toner image on an abhesive sheet of material to enable subsequent transfer of the image on to artwork or the like, and the application of adhesive from an adhesive donor sheet to the toner image such that, on contact between the toner image and the donor sheet under special conditions, the adhesive transfers from the donor sheet to the toner image. When the coated toner image is brought into contact with the material to which the image is to be applied, then the adhesion between the toner image and the material is greater than that between the abhesive sheet and the toner image, and the toner image is transferred. The initial creation of the toner image may either be by means of repeated passes of the abhesive sheet through a xerographic copier, whereby an image sufficiently robust for transfer is built up, or by means of a single pass, using a special toner in the xerographic copier which would provide an image robust enough for transfer.

The need for multiple passes is unsatisfactory as, for successful results, accurate registration is needed between the successively laid-down toner images. This is difficult to achieve reliably. In addition, successive passes result in the build-up not only of the desired image but also of the background contamination around the image. The alternative approach requires the provision of a special toner which, in a xerographic copier not dedicated to making images of this nature, is both costly and inconvenient. The application of the adhesive to the toner image is both time-consuming and requires the use of specialised apparatus.

In accordance with the present invention, the need to use special toner is avoided while retaining the ability to transfer the image produced in a single pass through the apparatus by applying from a coated carrier sheet a layer of adhesive using pressure and heat to transfer adhesive selectively to the toner image, which adhesive is capable of pulling the image from its support and adhering it to the artwork.

Thus, the present invention provides a method of transferring images on to artwork, which comprises the steps of:

forming the image to be transferred from toner by a xerographic process using as a substrate for the toner a first sheet having a surface with toner-release properties;

applying to a second sheet having a surface with abhesive properties a uniform layer of a pressure-sensitive adhesive;

placing the two sheets in face-to-face contact with each other, with a toner image on one surface in contact with

the adhesive on the other surface;
passing the assembly of the two sheets through means for applying force to the assembly, and raising its temperature, such that adhesive becomes adhered to the toner image more strongly than to its adhesive support, but remains more strongly adhered to its support than to the background surface of the first sheet not covered by toner;
separating the two sheets to leave adhesive adhering preferentially to substantially only the toner image;
placing the surface of the first sheet in contact with the artwork;
applying force to the back of the first sheet in at least those areas bearing a toner image, to cause the toner image to adhere to the artwork, and
separating the first sheet from the artwork to leave the toner images adhered to the artwork.

The xerographic imaging apparatus may be a xerographic copier or laser printer or like apparatus for depositing a toner image on to a substrate.

If desired, the toner image may be treated before the application of adhesive by the selective application thereto of a further layer of material, such as applied from a commercially-available blocking foil. This has the advantage of increasing the optical density of the toner image, and can provide a less-fragile image.

The nature of the adhesive and the nature of the surface of the carrier sheet on which the adhesive layer is carried, should be chosen such that the adhesive is transferred to the imaged sheet only where the adhesive is in contact with the toner image, and not in other

areas.

By suitable choice of adhesive composition, and of the surface of the sheet on to which the image is deposited, the adhesive may be caused to adhere only to the toner areas, thus leaving the surrounding areas free of adhesive.

The imaged sheet, now carrying adhesive substantially only over the image, can then be used by placing it, adhesive side down, on top of the artwork, and rubbing the back of the sheet to transfer the image to the artwork and leave it adhered there, when the sheet on to which the image was originally deposited is peeled away.

This selective application of adhesive to the toner image is effected by application of heat and pressure to the assembly of the two sheets, if appropriate formulations are used. The assembly of the two sheets preferably takes place such that the adhesive carrier sheet is placed on top of the image sheet with the adhesive layer contacting the toner image, and the back of the adhesive carrier sheet is uppermost. The assembly is then passed through a pair of heated rolls effective to heat the adhesive layer and cause it to adhere preferentially to the toner image.

The invention may be practised with a variety of materials, simple experiment being desirable to optimise adhesive composition and coating weight for use with any given toner imaging system. The surface of the sheet on to which the toner image is deposited by the photocopier or laser printer may be varied also, and needs to be chosen dependent upon the type of thermoplastic toner and

the fusing conditions used in order that the toner image adheres satisfactorily thereto such that it is not transferred from the sheet on to which it has been placed in the photocopier or laser printer, during the toner-fusing operation and during the application of adhesive thereto, but can be easily transferred to artwork under the action of the applied adhesive.

A particular advantage of the method of operation of the present invention is that it enables the production on artwork of coloured image areas when used in conjunction with a toner imaging colouring system. A specific advantage is that, using sequential toner transfer (on to the artwork) and coloured toner images, multicolour artwork images can be built up without difficulty.

Toner image colouring systems using blocking foils, and reliance upon the thermoplastic properties of toner images, have recently become widely used and commercialised. Specific mention may be made of the systems commercialised under the trade marks OMNICROM and COLOR TAG. In these systems, a blocking foil is placed over a toner image and heat and pressure applied, using either a heated nip between two rollers or a small hand-held heated platen. Under the action of heat and pressure, coloured material transfers selectively from the blocking foil to the toner image but not to the surrounding areas. In practising the method of the present invention, a first toner image may be laid down and then coloured by the use of heat and a blocking foil as just noted, whereafter, if desired, a second toner image may be laid down wholly or partly on top of the first toner image. The blocking foil treatment may then be repeated, e.g. using a different colour, and again the

transfer of colour from the blocking foil will be in only the areas where thermoplastic toner is still exposed, which means only to the second toner image, because the first image is already covered with a non-adhesive coloured layer.

In this way, colour overlay effects may be obtained rapidly and effectively.

The following examples will serve to illustrate the invention:

Example 1

Sheets of polyethylene terephthalate film of thickness 75 to 100 μm were coated with layer of a silicone release material.

The silicone release material was made by mixing together the following ingredients in the following proportions by weight:

| | parts by weight |
|---|---|
| Cellulose derivative solution (2% by weight in water of a non-ionic cellulose derivative, Natrosol HHR-P, ex National Starch) | 38.630 |
| Silicone premix | 3.213 |
| Vinylidene chloride aqueous copolymer emulsion (Polydene 33-041, ex Scott Bader) | 1.033 |

Polyalkylene oxide modified dimethylpoly-

Example 3

Example 1 was repeated but with the addition, between the making of the toner image and adhesing it, of a strengthening treatment; the polyethylene terephthalate sheet was imaged, then assembled, image side touching with a blocking foil (OMNICROM, black, ex Esselte Letraset Limited) and the assembly passed through a heated foil applicator (OMNICROM CT 100, speed setting 3, temperature setting 4). The Omnicrom foil was then peeled off; the black coating thereon was firmly adherent to the toner images, and could be selectively provided with an adhesive coating as described above.

The images were then transferred on to artwork. Transfer was easier than in Example 1 as the images were more robust. They also had a higher optical density.

siloxanes (Silvet L77, ex Union Carbide) 0.2

Water to 100.0

The silicone premix was an equal weight mixture of two grades of 40 percent by weight solids emulsion of a reactive organo-functional siloxane, one grade being without, and the other including, a dispersed catalyst, these being standard proprietary grades (Q2-7198 and Q2-7199, ex Dow Corning).

The release coat formulation was coated on to the polyethylene terephthalate sheets at a coating weight of 0.5 grams per square metre. Immediately after coating, the sheets were dried at 120° for 30 to 60 seconds to cure the silicone coating thereon.

These sheets were then imaged using a conventional thermoplastic toner xerographic system on a commercial photocopier (type Konica U-Bix 550Z).

Sheets of release paper were separately coated with a coating of a low-tack pressure-sensitive adhesive at a coating weight of 0.6 to 1.0 gram per square metre.

The formulation of the adhesive acutally used is as follows:

| | parts by weight |
|---|---|
| 1. Exsol 145/160 (aliphatic hydrocarbon solvent, ex Esso) | 23.4 |
| 2. Ethoxypropanol (Ex B.P. Chemicals) | 9.0 |

| | | |
|---|---|---|
| 3. | Aerosil R972<br>(Finely-divided silica, ex Degussa) | 4.0 |
| 4. | Oppanol B50 (20% in Exsol D145/160)<br>(Polyisobutylene resin, ex B.A.S.F.) | 15.7 |
| 5. | Hyvis 200<br>(Polybutylene resin, ex B.P. Chemicals) | 6.9 |
| 6. | ACP6 wax dispersion (12% in Exsol 145/160)<br>(Polyethylene wax, ex Allied Chemicals) | 41.0 |
| | | 100.0 |

This adhesive formulation was then diluted by taking 60 parts adhesive and 40 parts 'Exsol' 145/160, and coated so that a deposit in the range (0.6 - 1.0) gsm was achieved.

A variety of dry transfer adhesive compositions could be used, for example those described in GB 959 670, 1 577 617 and 2 005 598.

The imaged polyethylene terephthalate sheet was then brought into contact with the adhesive-coated sheet, with its imaged side in contact with the adhesive coating.

The assembly of the two sheets was then fed into a heat and pressure applicator such as that sold under the trade mark "OMNICROM". With the correct choice of adhesives, release materials and operating conditions (of which the latter can be determined empirically) the bond between the adhesive and the toner image becomes stronger than the bond between the adhesive and its substrate surface,

which latter bond remains stronger than the bond between the adhesive and the background areas of the image substrate. On peeling apart the release paper and polyethylene terephthalate sheets, adhesive becomes transferred preferentially to the toner image.

The sheet bearing the toner image was then laid on to a piece of artwork, adjusted to the desired position and the toner image urged against the artwork by rubbing over the back of the polyethylene terephthalate sheet with a stylus or otherwise, either uniformly or only on the back of the toner image. On peeling the polyethylene terephthalate sheet away, the toner image remained adhered preferentially to the artwork and separated cleanly from the release coating on the polyethylene terephthalate sheet.

Example 2

Sheets of polyethylene terephthalate film of thickness 75 to 100 μm were coated with a surface coating of polyvinyl octadecyl carbamate. The coating was applied from a 2% by weight solution of this polymer in toluene, and at a coating weight such that the dried coating weight was around 0.5 grams per square metre. These sheets were imaged using a conventional thermoplastic toner xerographic system on a commercial photocopier (type Konica U-Bix 550Z).

These sheets were then used with release paper sheets coated with low-tack pressure-sensitive adhesive as used in Example 1. Similar, though not quite as good, results were obtained.

## CLAIMS

1. A method of transferring images on to artwork, which comprises the steps of:

forming the image to be transferred from toner by a xerographic process using as a substrate for the toner a first sheet having a surface with toner-release properties;

applying to a second sheet having a surface with abhesive properties a uniform layer of a pressure-sensitive adhesive;

placing the two sheets in face-to-face contact with each other, with a toner image on one surface in contact with the adhesive on the other surface;

passing the assembly of the two sheets through means for applying such force to the assembly, and raising its temperature, such that adhesive becomes adhered to the toner image more strongly than to its adhesive support, but remains more strongly adhered to its support than to the background surface of the first sheet not covered by toner;

separating the two sheets to leave adhesive adhering preferentially to substantially only the toner image;

placing the surface of the first sheet in contact with the artwork;

applying force to the back of the first sheet in at least those areas bearing a toner image, to cause the toner image to adhere to the artwork, and

separating the first sheet from the artwork to leave the toner images adhered to the artwork.

2. A method according to Claim 1, wherein, after formation of the toner image and prior to the selective application of adhesive to the toner image, a further

layer of coloured material is applied selectively to the toner image from a blocking foil.

3. A method as claimed in Claim 2, wherein the colour of the further applied material is different from the colour of the toner.